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EXAMINER

BARTLEY, KENNETH

ART UNIT	PAPER NUMBER
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3693

NOTIFICATION DATE	DELIVERY MODE
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ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

eofficemonitor@woodcock.com

Office Action Summary	Application No. 10/584,826	Applicant(s) REDMAYNE, JOHN MICHAEL	
	Examiner KENNETH BARTLEY	Art Unit 3693	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 October 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) See Continuation Sheet is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) See Continuation Sheet is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/18/2010</u> . | 6) <input type="checkbox"/> Other: _____ |

Continuation of Disposition of Claims: Claims pending in the application are 165-170, 183-224, 237-278, and 291-326.

Continuation of Disposition of Claims: Claims rejected are 165-170, 183-224, 237-278, and 291-326.

DETAILED ACTION

1. Receipt of Applicant's amendment filed 10/18/2010 is acknowledged.

Response to Amendment

2. Claims 165, 169, 170, 183, 185-195, 197-224, 237-278, and 291-326 have been amended. Claims 1-164, 327, 331-332, 336-337, 341-342, 346-347, 351-352, 356-357, 361-362, 366-367, and 371 have been canceled. Claims 171-182, 225-236, 279-290, 328-330, 333-335, 338-340, 343-345, 348-350, 353-355, 358-360, 363-365, and 368-370 have been withdrawn. Claims 165-170, 183-224, 237-278, and 291-326 are pending and are provided to be examined upon their merits.
3. This action is made non-final based on a new claim objection, new or modified 35 USC §112, 2nd para. rejections, and a new 35 USC §101 rejection.

Response to Arguments

4. Applicant's arguments with respect to claims 165-170, 183-224, 237-278, and 291-326 have been considered but are moot in view of the new ground(s) of rejection. Nevertheless, a response is provided below in **bold** where appropriate.

Applicant argues 35 USC § 101 rejection, starting pg. 87 or Remarks:

Claim Rejections - 35 USC § 101

Claims 165-170, 183-218, 327, 331, 342, 346, 357, and 361 stand rejected under 35 USC § 101 because the Office states that the claimed invention is directed to non-statutory subject matter. Official Action, at 3. Specifically, the Office states:

According to the recent Guidelines issued by the Deputy Commissioner, in order for a method claim to qualify as a patent eligible process under 35

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USC § 101, the process of the method claim must (1) be tied to another statutory class (such as a particular apparatus) or (2) transform underlying subject matter (such as an article or materials) to a different state or thing.

In the instant case, none of the process steps of the method claims 165 and 209 are tied to an apparatus such as a computer. Accordingly, the claimed invention fails to qualify as a statutory process under the Guidelines.

The applicant is requested to indicate where in the specification there is support for the amended claim. Note: merely reciting a computer in the preamble does not meet the aforementioned requirement nor reciting a nominal process such as communicating data with a computer. See also, *In Re Bilski* (2008, 545 F3d 943). *Id.*

Applicant notes that at the date of the present Official Action, 17 June 2010, the USPTO had not developed guidelines in response to the Supreme Court's decision in *Bilski v. Kappos*. At that time the relevant, most recently issued USPTO guidelines were "Interim Examination Instructions for Evaluating Subject Matter Eligibility Under 35 U.S.C. 101," dated August 24, 2009 ("the Interim Instructions"). The Interim Instructions stated that "A process claim, to be statutory under § 101, must pass the machine-or-transformation test..." ("the M-or-T test").

The Supreme Court's subsequent decision in *Bilski v. Kappos* states that the M-or-T test is not the sole test for deciding whether an invention is a patent-eligible process. On July 27, 2010 the USPTO issued "Interim Guidance for Determining Subject Matter Eligibility for Process Claims in View of *Bilski v. Kappos*" ("the Interim Bilski Guidance") that acknowledged this. The Interim Bilski Guidance presents factors to be considered when evaluating patent-eligibility of method claims. It is submitted that, in light of these factors, claims 165-170, 183- 218, 327, 331,342, 346, 357, and 361 are patent-eligible under 35 U.S.C. § 101.

Respectfully, the claims cannot be abstract.

Claims 165-170, 183-218,327,331,342, 346, 357, and 361 are all computer implemented. It is integral to the implementation of the invention described in Applicant's method claims that they are all implemented on a machine. It is integral that Applicant's invention is implemented on a machine due to both the volume of data typically required to be analysed, and the speed with which this processing is required in a real-time trading environment. The use of a machine goes beyond mere data gathering or a field-of-use limitation.

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Respectfully, claims are interpreted in light of the specification, but limitations are not read into the claims. Computers performing steps must be recited in the claim.

A significant technical effect or feature of claims 165-170, 183-218, 327, 331, 342, 346, 357, and 361 is that:

...a range of different securities can be evaluated within a single, unified and coherent framework, thereby leading to significant reduction in the computing resources otherwise required.

Instant Specification, at [0001];

In the case of this example, a single option pricing model that could parsimoniously fit option prices to observed market prices (i.e. explain the Black- Scholes implied volatility surface) would eliminate the need to run the second model with consequential savings in the required computer resources, a reduction in the possibility of modelling errors and faster processing times. In a real-time trading environment the latter two technical effects are particularly important.

Id., at [0003];

In the case of equity securities (for example, stocks or shares) a range of models are typically used in their analysis. These models include the Capital Asset Pricing Model, shown in FIG. 2, the Fama-French three factor model and the Arbitrage Pricing Theory. While in the case of debt-type securities a different suite of models is typically applied. For example, the Merton option-theoretic model or the reduced form model. In the case of the Merton option-theoretic model, applied in a risk neutral world, it is known in the art that the resulting probability of default estimates are not "real world" estimates. Hence a second model is then typically required to "map" the risk neutral default probability estimates to real world default probabilities, as shown in FIG. 3 and as, for example, applied by commercial service provider Moodys KMV.

Id., at [0004]; and

In summary, while there have been attempts to introduce a coherent framework for analysing different types of securities, or assets, to date none have been able to achieve a parsimonious and efficacious approach that results in a reduction in the databases, models and computing resources required by users.

Id., at [0010].

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the above paragraphs) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Hence, by using the invention described in claims 165-170, 183-218,327, 331,342, 346, 357, and 361, there is a physical transformation (a reduction) in the computing resources otherwise required to evaluate a range of securities.

Respectfully, it is unclear what physical transformation is happening in the claims. Price of an asset, for example, is a concept (e.g. a price is not physical but an abstract concept). Transformation or reduction of prices based on a formula is not a physical transformation.

Claims 165-170, 183-218,327,331,342, 346, 357, and 361 are not directed to application of a law of nature. Neither do any of these claims involve a general concept, whose use in other fields would be pre-empted. Nor are any of these claims so abstract and sweeping as to cover both known and unknown uses of the concepts, including performance without any apparatus. Nor do any of these claims cover all possible solutions to securities evaluation in a parsimonious manner.

In summary, it respectfully submitted that in light of the Supreme Court's ruling in *Bilski v. Kappos*, claims 165-170, 183-218,327,331,342, 346, 357, and 361 qualify as a patent eligible processes under 35 USC § 101. Despite these remarks, in the present response, Applicant cancels claims 327, 331,342, 346, 357, and 361 for other reasons.

The Examiner thanks the Applicant for their detailed response.

Applicant argues product claims, pg. 90 or Remarks:

Claims 273-278, 291-322, 323-326, 337, 341,352, 356, 367, and 371 stand rejected under 35 USC § 101 because the Office states that the claimed invention is directed to non- statutory subject matter. Official Action, at 4. Specifically, the Office states:

Product claim 273, for example, has in the preamble "A computer-readable medium having computer-executable instructions..." Applying the broadest reasonable interpretation to the claim, the instructions are not

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required to be stored in a non-transitory manner on the medium, resulting in claims directed at transitory signals. (MPEP 2106.01 I). Claim 317 has the same problem.

Claims 274-278, 291-316, 318-322, 323-326, 337, 341, 352, 356, 367, and 371 are rejected because they depend from their respective independent claim.

Id.

The Applicant has amended claims 273-278, 291-322, and 323-326 to exclude transitory signals. For example, Applicant has amended claim 273 to read, "A non-transitory computer-readable medium..." Applicant cancels claims 337, 341, 352, 367, and 371 for reasons other than the rejections under 35 USC § 101.

The Examiner thanks Applicant and withdraws the rejection regarding non-transitory for the product claims.

A new 35 USC 101 rejection is provided. Claims cannot be abstract.

Applicant argues 35 USC § 112 rejection, starting pg. 90 of Remarks:

Claim Rejections - 35 USC § 112

Claims 165-170, 183-224, 237-278, 291-327, 331-332, 336-337, 341-342, 346-347, 351-352, 356-357, 361-362, 366-367, and 371 stand rejected as being rejected under 35 USC § 112, second paragraph, because the Office states that they are indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Official Action, at 4.

The Office states, "Claim 165 recites the limitation 'the rate of return' in the preamble. There is insufficient antecedent basis for this limitation in the claim. Claims 219 and 273 have the same problem." Official Action, at 5. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 165 recites 'the risk attributes' in the preamble. There is insufficient antecedent basis for this limitation in the claim. Claims 219 and 273 have the same problem." Official Action, at 5. Applicant has amended these claims to overcome the rejections.

Withdrawn.

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The Office states, "Claim 165 recites 'the volatility of returns' in step 2. There is insufficient antecedent basis for this limitation in the claim. Claims 219 and 273 have the same problem." Official Action, at 5. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 165 recites 'the price per unit' in step 2. There is insufficient antecedent basis for this limitation in the claim. Claims 219 and 273 have the same problem." Official Action, at 5. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 165, step 1 has '...the rate of return for each security' where there is no prior step of calculating a rate of return for each security. Claims 219 and 273 have the same problem." Official Action, at 5.

Applicant respectfully disagrees. The introduction to the claim states that a rate of return for said securities is related to a price or value of said securities and risk attributes of said securities. The nature of this relationship is established by the steps of the claim. The rate of return for each security can either be an input to modelling this relationship, or be an output of this process. This is over to the user to decide. Various of the dependent claims describe specific embodiments that describe how this can be done.

The general concept that the rate of return on a risky asset comprises the risk free rate plus a risk premium is well known by those with skill in the art. The instant specification at [0037] describes how the expected rate of return on a security in excess of the risk free rate of return is the expected excess return for that security and that this is equal to the product of the risk exposures and prices per unit of risk for that security.

Withdrawn based on further consideration and the above arguments. Arguably inherent with any rate of return is a risk premium.

Claim 165, step 1 has 'determining a risk premium incorporated in the rate of return...' where it is indefinite as to what determining a risk premium means if there is already a risk premium in the rate of return. This is interpreted to mean determining a risk premium rate for each of the plurality of securities, wherein said risk premium rate is part of the calculated rate of return for each of the plurality of securities. Claims 219 and 273 have the same problem.

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Official Action, at 5. Applicant respectfully disagrees that these claims are indefinite for reasons similar to those described, supra, for the phrase "...the rate of return for each security" in claims 165,219, and 273.

Respectfully, it remains indefinite as to determining a risk premium incorporated into the rate of return. The risk premium could be arbitrarily decided by someone or based on the difference between a risk-free return or something else. This rejection is modified but maintained.

The Office states,
Claim 165, step 2 has 'designating that a price [sic] risk factor incorporated in the risk premium..., is the volatility of returns' where it is indefinite as to how a price [sic] risk factor is designated if the price risk factor has first not been determined. A prior step of determining a price [sic] risk factor is required. Claims 219 and 273 have the same problem.

Official Action, at 5-6.

Applicant respectfully notes that the Office's reference to "price risk factor" should be to "priced risk factor." Applicant respectfully disagrees that these claims are indefinite for reasons similar to those described, supra, for the phrase "...the rate of return for each security" in claims 165,219, and 273, and furthermore, the general concept that the risk premium for a risky asset is the product of one or more risk premia multiplied by the sensitivity of that risky asset to each of those risk premia is understood by those with skill in the art. Where there is a single priced risk factor, which is the market factor, this model is known as the Capital Asset Pricing Model. Where there are multiple market-wide economic risk factors that are priced, this model is known as the Arbitrage Pricing Theory.

With all due respect, designating is indefinite. Further, this step basically designates a solution to a problem (how does someone do this?). It is further indefinite as to how this step relates to the prior step of determining and the subsequent step of defining. A modified rejection is provided to further elaborate on why this is indefinite.

The Office states,
Claim 165, step 2 has 'designating that a price risk factor incorporated in the risk premium..., is the volatility of returns ...' where it is indefinite as to how designating occurs if volatility of returns is incorporated in the price risk factor. This step is interpreted to mean designating a volatility of returns based on the determined price risk factor for each of the plurality of securities, wherein the volatility of returns is part of the price risk factor ... Claims 219 and 273 have the same problem.

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Official Action, at 6.

Applicant respectfully disagrees that these claims are indefinite for reasons similar to those described, supra, for the phrase "...the rate of return for each security" in claims 165, 219, and 273, and furthermore, the terminology used by Applicant is known to those with skill in the art. The volatility of returns is not 'incorporated' in the priced risk factor, it is a priced risk factor. Other priced risk factors could include other statistical attributes of returns, such as skewness, or different factors such as liquidity.

Withdrawn.

The Office states,
Claim 165, step 2 has 'designating ... is the volatility of returns, measured over discrete time, and that the price per unit of this risk factor is the same for two or more of the said securities; ...' where measured over discrete time is indefinite based on the function of designating. This is interpreted to mean that when determining a rate of return, the rate of return is over a discrete time period. Claims 219 and 273 have the same problem.

Official Action, at 6. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states,
Claim 165, step 2 has '... the price per unit of this risk factor ...' where it is indefinite as to what 'price per unit' refers to (e.g. price/share). Also, it is indefinite as to how rate of return (factor or percent) relates to risk factor, if the risk factor is a price per unit. Rate of return is based on discounting net cash flows over time. How does a 'price risk factor' with a price per unit relate to a risk premium and a rate of return, where rate of return is discounted net cash flow over initial investment? Claims 219 and 273 have the same problem.

Official Action, at 6.

Applicant respectfully disagrees. As stated in the claim, the price per unit is the price per unit of the risk factor. It is commonly understood in the art that where risk factors are priced, then the rate of return for a security will reflect or incorporate a risk premium equal to the product of its exposure to that risk factor times the "price" of that risk. This requires that the price of risk be expressed "per unit" of the risk factor. In the art these concepts are commonly applied to economy-wide priced risk factors such as GDP growth, oil prices and/or a stock market index.

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In the Applicant's invention, the rate of return for a security includes a security-specific risk premium in respect of each priced-risk factor. That security-specific risk premium is the product of that security's exposure to each priced risk factor times a risk premium or price of risk for each risk factor, wherein this price of risk is the same for two or more securities associated with an underlying asset.

Withdrawn.

The Office states, "Claim 165, step 3 has 'defining a model comprising data ...' where it is indefinite as to how data is a model. Claims 219 and 273 have the same problem." Official Action, at 7. Applicant has amended these claims to overcome the rejections.

The Office states, "Claim 165, step 3 has '...a model comprising data representing relationships ...' where it is indefinite as to how data represents relationships. Claims 219 and 273 have the same problem." Official Action, at 7. Applicant has amended these claims to overcome the rejections.

This remains indefinite. Defining a financial model representing a relationship between risk premiums could be anything.

The Office states, "Claim 165, step 3 has '...relationships between the risk premiums...' where relationships is indefinite since this could be anything. This is interpreted to mean the risk premiums are different for each security. Claims 219 and 273 have the same problem." Official Action, at 7. Applicant has amended these claims to overcome the rejections.

The Office states,
Claims 209 and 317 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: 1) risk parameters are generated from the model, but no model has first been created; 2) the risk parameters have been 'estimated over a discrete time period' but no step of estimating the risk parameters over a time period is provided; 3) solving the model based on values specified by a user where the user has not yet provided values.

Official Action, at 7. Applicant has amended these claims to overcome the rejections.

Respectfully, the steps of these claims remain indefinite. Steps need to claim the invention.

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The Office states, "Claims 209, 273, and 317 are computer readable media having where a computer or processor is required to carry out the computer instructions." Official Action, at 7. Applicant has amended claims 273, and 317 to overcome the rejections, and notes that claim 209 does not recite "computer readable media."

**Claim 209 is not a product claim and does not apply as indicated by Applicant.
Withdrawn.**

Claims 219 [sic] is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: Claim 219 is a system claim with memory, a user interface, and units. There is no bus to connect the units together or to a network.

Official Action, at 7-8. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states,
Claims 263 [sic] is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: Claim 263 is a system claim with memory and a processing unit, where a user specifies values, but there is no user interface, no network, and no bus. Further, it is indefinite as to what processing units are involved (see Fig. 5).

Official Action, at 8. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states,
Claim 263 is indefinite as to how generate risk parameters from a model where the model has not been created (could be anything). Risk parameters over an estimated time period is indefinite since the risk parameters are generated from a model, therefore the parameters would have to be determined for a time period

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unless the model provides specific time periods of already estimated parameters. It is indefinite as to how the model is solved to the parameters equal values specified by users.

Official Action, at 8. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 169 recites the limitation 'the expected default loss' in the preamble. There is insufficient antecedent basis for this limitation in the claim. Claims 223 and 277 have the same problem. Official Action, at 8. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 169 recites the limitation 'of another, debt-type security' in the preamble. There is insufficient antecedent basis for this limitation in the claim. There is no debt type security from which another relates to. Claims 223 and 277 have the same problem." Official Action, at 8-9. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 169 recites the limitation 'the promised yield' the first step. There is insufficient antecedent basis for this limitation in the claim. Claims 223 and 277 have the same problem." Official Action, at 9. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 169 recites the limitation 'the excess return' in the calculating the excess return step. There is insufficient antecedent basis for this limitation in the claim. Claims 223 and 277 have the same problem." Official Action, at 9.

Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 169 recites the limitation 'the risk free rate of return' in the calculating the excess return step. There is insufficient antecedent basis for this limitation in the claim. Claims 223 and 277 have the same problem." Official Action, at 9.

Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 169 recites the limitation 'the exposure of each security' in the calculating the exposure step. There is insufficient antecedent basis for this limitation in the claim. Claims 223 and 277 have the same problem." Official Action, at 9.

Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 169 recites the limitation 'the product of the risk exposures' in the calculating a price per unit step. There is insufficient antecedent basis for this limitation in the claim. Claims 223 and 277 have the same problem." Official Action, at 9. Applicant has amended the claims to clarify that this is the sum of the products, which is a mathematical term known in the art.

A new rejection is provided based on the amendment. Respectfully, there is not one known sum of the products.

The Office states, "Claim 169 recites the limitation 'calculating the excess rate of return' in the calculating the excess return step. There is insufficient antecedent basis for this limitation in the claim. Claims 223 and 277 have the same problem.." Official Action, at 9. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 169 recites the limitation 'the other securities being analysed' in the calculating the excess rate of return step. There is insufficient antecedent basis for this limitation in the claim. Claims 223 and 277 have the same problem." Official Action, at 10. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 169 has 'parameters of interest' in the providing step where parameters of interest are indefinite as there is no limitation as to where the parameters of interest come from or how they are determined. Claims 223 and 277 have the same problem." Official Action, at 10. Applicant has amended these claims to overcome the rejections.

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Withdrawn.

The Office states, "Claim 170 recites the limitation 'the relationship between the firm specific price' in the first step. There is insufficient antecedent basis for this limitation in the claim. Claims 224 and 278 have the same problem." Official Action, at 10. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 170 recites the limitation 'the rate of return (rk) on another class' in the second step. There is insufficient antecedent basis for this limitation in the claim. Claims 224 and 278 have the same problem." Official Action, at 10. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 170 recites the limitation 'the default loss on said securities' in the third step. There is insufficient antecedent basis for this limitation in the claim. Claims 224 and 278 have the same problem." Official Action, at 10. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 183 recites the limitation 'the real world distribution' in the first step. There is insufficient antecedent basis for this limitation in the claim. Claims 237 and 291 have the same problem." Official Action, at 10. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 183 recites the limitation 'the returns on the underlying asset' in the first step. There is insufficient antecedent basis for this limitation in the claim. Claims 237 and 291 have the same problem." Official Action, at 10. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 183 recites the limitation 'the real world probability' in the first step. There is insufficient antecedent basis for this limitation in the claim. Claims 237 and 291 have the same problem." Official Action, at 11. Applicant has amended these claims to overcome the rejections.

Withdrawn.

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The Office states, "Claim 183 recites the limitation 'the expected mean, standard deviation ... ' in the third step. There is insufficient antecedent basis for this limitation in the claim. Claims 237 and 291 have the same problem." Official Action, at 11. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 183 recites the limitation 'the aforesaid parameters...the real world payoff in the forth step. There is insufficient antecedent basis for this limitation in the claim. Claims 237 and 291 have the same problem." Official Action, at 11. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 183 recites the limitation 'the aforesaid parameters' where it is indefinite as to what parameters are required to calculate. Claims 237 and 291 have the same problem." Official Action, at 11. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 183 recites the limitation 'the expected option payoff in the fifth step. There is insufficient antecedent basis for this limitation in the claim. Claims 237 and 291 have the same problem." Official Action, at 11. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 183 recites the limitation 'moments of higher interest to the user., for any other factors specified by a user... ' where it is indefinite as to why the user is not specifying other factors. Claims 237 and 291 have the same problem." Official Action, at 11. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 183 has 'parameters of interest' in the providing step where parameters of interest are indefinite as there is no limitation as to where the parameters of interest come from or how they are determined. Claims 237 and 291 have the same problem." Official Action, at 11. Applicant has amended these claims to overcome the rejections.

Withdrawn.

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The Office states, "Claim 204 recites the limitation 'the portions of that distribution.' There is insufficient antecedent basis for this limitation in the claim. Claims 258 and 312 have the same problem." Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 206 recites the limitation 'the returns on the firm...' There is insufficient antecedent basis for this limitation in the claim. Claim 314 has the same problem." Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Respectfully, the term “the returns of the firm” lacks antecedence.

The Office states, "Claim 185 has 'parameters of interest' in the providing step where parameters of interest are indefinite as there is no limitation as to where the parameters of interest come from or how they are determined. Claims 239 and 293 have the same problem." Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states,
Claim 186 has the following antecedence problems: 'the real world distribution process'; 'the expected real world probability'; 'the mean, standard deviation ...'; 'the distribution process'; 'the time horizon of interest'; 'the aforesaid parameters'; 'the real world payoff'; 'the chosen evaluation date'; 'the price per unit of risk...'
Claims 240 and 294 have similar problems.
Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 186 has 'parameters of interest' in the providing step where parameters of interest are indefinite as there is no limitation as to where the parameters of interest come from or how they are determined. Claims 240 and 294 have the same problem." Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 187 recites the limitations: 'additional multi-variate equations ...'; '... the variables ...' in the first step. There is insufficient

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antecedent basis for this limitation in the claim. Claims 241 and 295 have the same problem." Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 187 recites the limitations: 'the remaining unknown variables ...'; '... in the equations' in the second step. There is insufficient antecedent basis for this limitation in the claim. Claims 241 and 295 have the same problem." Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 188 recites the limitation: 'the unknown inputs...'. There is insufficient antecedent basis for this limitation in the claim. Claims 189-195, 242-249, and 296-303 have the same problem." Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 191 recites the limitation: 'the correlation between...'. There is insufficient antecedent basis for this limitation in the claim. Claims 245 and 299 have the same problem." Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 190 recites the limitation: 'the covariance between the returns...'. There is insufficient antecedent basis for this limitation in the claim. Claims 192, 244, 246, 298, and 300 have the same problem." Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 193 recites the limitation: 'the expected probability of default.' There is insufficient antecedent basis for this limitation in the claim. Claims 201, 247, 255, 301, and 309 have the same problem." Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 195 recites the limitation: 'the expected default loss...'. There is insufficient antecedent basis for this limitation in the claim. Claims 249

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and 303 have the same problem." Official Action, at 12. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 197 recites the limitation: 'the correlation between the returns...' There is insufficient antecedent basis for this limitation in the claim. Claims 199, 251, 253, 305, and 273 have the same problem." Official Action, at 12. Applicant has amended claims 197, 199, 253, and 305 to overcome the rejections, and note that claim 273 does not recite "the correlation of returns."

Withdrawn. Noted regarding claim 273.

The Office states, "Claim 198 recites the limitation: 'the covariance between the returns...' There is insufficient antecedent basis for this limitation in the claim. Claims 200, 252, 254, and 306-307 have the same problem." Official Action, at 12. Applicant has amended claims 198, 200, 252, 254, and 306 to overcome the rejections, and note that claim 307 does not recite, "the covariance between returns" (though it does recite, "the correlation of returns").

Withdrawn. Thanks for fixing the correlation instead in claim 307.

The Office states, "Claim 202 recites the limitation: 'the expected loss given default.' There is insufficient antecedent basis for this limitation in the claim. Claims 256 and 310 have the same problem." Official Action, at 14. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 203 recites the limitation: 'the expected default loss...' There is insufficient antecedent basis for this limitation in the claim. Claims 257 and 311 have the same problem." Official Action, at 14. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 205 recites the limitation: 'the portions of that distributio [sic] ...' There is insufficient antecedent basis for this limitation in the claim. Claims 259 and 313 have the same problem." Official Action, at 14. Applicant has amended these claims to overcome the rejections.

Withdrawn.

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The Office states, "Claim 207 recites the limitation: 'the real world statistical distribution process...' There is insufficient antecedent basis for this limitation in the claim. Claims 261 and 315 have the same problem." Official Action, at 14. Applicant respectfully submits that the amendments to respective parent claims 186, 240, and 294 overcome these rejections.

Withdrawn.

The Office states, Claim 208 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: there is no receiving step providing values for the parameters listed in the equation; there is no calculating step that determines values for the two equations. Further, if this is a transcendental equation, it is indefinite as to how the equation is solved (i.e. is an iterative process required). Claims 262 and 316 have the same problem.

Official Action, at 14. Applicant has amended the claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 208 recites various parameters. For example: S_n is the value of the equity of the firm at time n . There is no antecedent basis for the value of the equity at time n . Other parameters listed have similar problems. Claims 262 and 316 have the same problem." Official Action, at 14-15. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 210 recites the limitation: 'the returns ... ' and 'the securities ... ' There is insufficient antecedent basis for this limitation in the claim. Claims 264 and 318 have the same problem." Official Action, at 15. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 211 recites the limitation: 'the correlation ... ' and 'between the returns... ' There is insufficient antecedent basis for this limitation in the claim. Claims 213, 265, 267, 319 and 321 have the same problem." Official Action, at 15. Applicant has amended these claims to overcome the rejections.

Withdrawn.

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The Office states, "Claim 212 recites the limitation: 'the covariance ... ' and 'between the returns ... ' There is insufficient antecedent basis for this limitation in the claim. Claims 214, 266, 368, 320, and 322 have the same problem." Official Action, at 15. Applicant notes that claim 368 does not recite, "the covariance..." or "between the returns..." (Applicant submits that perhaps the Office intended to refer to claim 268). Applicant has amended claims 214, 266, 320, and 322 to overcome these rejections.

Withdrawn. Examiner thanks Applicant for fixing 268.

The Office states, "Claim 213 recites the limitation: 'the returns of the total firm.' There is insufficient antecedent basis for this limitation in the claim. Claims 214, 267-268 and 321-322 have the same problem." Official Action, at 15. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, Claim 215 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: there is no receiving step providing values for the parameters listed in the equation; there is no calculating step that determines values for the two equations; there is no defining of the variables in the claim. Claims 215, 269-270, and 323-324 have the same problem. Official Action, at 15. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 215 recites the limitation: 'the formula...' There is insufficient antecedent basis for this limitation in the claim. Claims 216-218, 269-272 and 323-326 have the same problem." Official Action, at 16. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 215 recites '...formula for calculating additional parameters... for calibration with the model comprise:...' two formulas are listed. There are two formulas (not formula), and it is indefinite as to how calibration is accomplished with the two formulas. Claims 216, 269-270 and 323-324 have the same problem." Official Action, at 16. Applicant has amended these claims to overcome the rejections.

Withdrawn.

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The Office states, "Claim 217 recites '...formula for calculating additional parameters... for calibration with the model comprise:...' where multiple formulas are listed. It is indefinite as to how calibration is accomplished with the formulas. Claims 218, 271-272, and 325-326 have the same problem." Official Action, at 16. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, Claim 217 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: there is no receiving step providing values for the parameters listed in the equation; there is no calculating step that determines values for the equations; there is no defining of the variables in the claim. Claims 218, 271-272, and 325-326 have the same problem. Official Action, at 16. Applicant has amended these claims to overcome the rejections.

Withdrawn.

The Office states, "Claim 308 recites the limitation: 'the covariance between the returns ...' There is insufficient antecedent basis for this limitation in the claim." Official Action, at 16. Applicant has amended this claim to overcome the rejection.

Withdrawn.

The Office states, "Claims 331 and 336 are hybrid claims. Hybrid claims occur when two different statutory categories are claimed. For example, claim 331 is directed at a product, but is part of a method claim. Claims 327, 332, 342, 346-347, 351, 357, 361-362, and 366 have a similar problem." Official Action, at 16-17. Applicant has cancelled these claims in the present response.

Withdrawn as it is now moot.

The Office states, "Claims 166-170, 183-208, 210-218, 220-224, 237-262, 264-272, 274-278, 291-316, 318-327, 331-332, 336-337, 341-342, 346-347, 351-352, 356-357, 361-362, 366-367, and 371 are also rejected because they depend from their respective independent claim." Official Action, at 17. Applicant submits that present amendments and remarks regarding the respective parent claims overcomes the present rejections under 35 USC § 112, second paragraph.

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Most of the rejections involving the dependent claims were withdrawn. The independent claims still have rejections, some of which have been modified to clarify the rejection to reflect the amendments. The Examiner thanks Applicant for their detailed response.

Applicant argues 35 USC 103 rejection, starting pg. 104 or Remarks:

The invention described in Applicant's independent claims stand rejected as being unpatentable over the combination of Sandretto and Pang et al. In addition, some of the claims stand rejected over the combination of Sandretto in view of Pang in further view of Erlach et al, Hunealt, Lipton et al, or Sant.

In the following remarks Applicant focuses attention on the rejections based on the combination of Sandretto in view of Pang. As Applicant shows below, (1) this combination fails to teach certain important aspects of Applicant's claimed subject matter, (2) is also unsupported as lacking a rational explanation of why the combination would have been obvious, and (3) is improper for purposes of finding Applicant's independent claims unpatentable. As Applicant also shows below, the prior art teaches away from Applicant's subject matter and Applicant's subject matter produces unexpected results. For purposes of economy, Applicant has not presented separate detailed arguments in respect to the further combinations of Sandretto in view of Pang and further in view of either Erlach et al, Hunealt, Lipton et al, or Sant. However, Applicant respectfully and explicitly traverses all bases for rejecting the claims as set forth in the Official Action.

Regarding claims 215-218, 269-272, and 323-326:

Claims 215-218, 269-272, and 323-326 stand rejected, in part, because the Office states that they recite limitations that carry no patentable weight as being non-functional descriptive material. Official Action, at 35-36. Applicant has amended the claims, and submits that the amended claims overcome the rejections.

Rejection of claims 218, 272, and 326 as non-functional descriptive material is withdrawn.

Regarding claims 204, 206, 258, 260, 312, and 314:

Claims 204, 206, 258, 260, 312, and 314 stand rejected as being given no patentable weight due to intended use language. Official Action, at 35. Regarding claims 204, 258, and 312, the Office states, "Use of 'are expected to follow...' is intended use since the returns may never follow the specified distribution." Official Action, at 35. Applicant respectfully disagrees. The phrase cited by the Office is part of the term used in these claims: "the real world distribution process that the returns on the firm (or underlying asset) are expected to follow ..." Claim 206 is dependent on claim 204, which in turn is dependent on claim 183, and claim 183 provides the antecedent basis for this term. The first recitation of claim

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183 is, "specifying the real world distribution process that the returns on the underlying asset are expected to follow." Hence the use of the term "the real world distribution process that the returns on the firm (or underlying asset) are expected to follow .." in claims 204 and 206 is not intended use language, but a description of a model input. Similarly, claim 260 is dependent on claim 258, which in turn is dependent on claim 237, and claim 314 is dependent on claim 312, which in turn is dependent on claim 293. The same analysis applies to claims 258, 260, 312, and 314, mutatis mutandis.

In further reviewing the claims and consideration of the above remarks, the rejections are withdrawn.

That ex post returns may never follow the specified distribution is irrelevant. What is relevant to a user is the ex ante, expected distribution of returns. This concept of "expectations" is well known to those with skill in the art.

In further reviewing the claims and consideration of the above remarks, the rejections are withdrawn. Rejection of claims 204, 206, 258, 260, 312, and 314 as intended use language is withdrawn

Applicant reviews their specification, starting pg. 105 of Remarks:

I. The Claimed Invention

Applicant's Disclosed Subject Matter

As discussed in paragraph [0014] of the instant specification, the broad concept of the invention is that two or more securities issued by, or referenced to, a firm (or other asset) share exposure to the same underlying sources of risk and the price of these priced risk factors can be analysed at the firm (or asset) specific level. In particular, in the case of the price of the risk of volatility, measured over discrete time, of expected returns the price of risk (i.e. the volatility risk premium) is the same for all firm (or asset) specific securities. Moreover, in the case of debt- type securities the promised yield spread is analysed as comprising at least an expected default loss component and an expected risk premium (or premia) component.

As discussed in paragraph [0083] of the instant specification, the invention differs from other models known in the art, such as the Capital Asset Pricing Model and the Arbitrage Pricing Theory, which latter models include a market-wide price of risk. The latter models are not based on underlying asset specific measures of total risk, but rather are implemented by only pricing the systematic or market correlated element of risk or risks.

As discussed in paragraph [0114], and illustrated in figure 8, of the instant specification, despite the Black-Scholes option pricing model being based on the

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premise of a single volatility input, the volatilities implied by market option prices and inverting the Black-Scholes model differ across different strike prices - the so called "volatility smile" problem. As discussed in paragraph [0115] of the instant specification, a preferred embodiment of the invention provides a much closer fit to observed market prices across all exercise prices.

Applicant reviews their claims, starting pg. 106 of Remarks:**Applicant's Claims**

The instant application includes two general groups of claims, each with three independent claims. One general group includes independent claims 165, 219, and 273, while the other general group includes independent claims 209, 263, and 317.

In the first group of claims, claim 165 is directed to a computer implemented method, claim 219 is directed to a system, and claim 273 is directed to a computer readable medium. Each of the independent claims in this group recites that a risk premium is incorporated in the rate of return for each security, that the price per unit of a priced risk factor is the same for two or more securities associated with an underlying asset and that a priced risk factor is the volatility, measured over discrete time, of returns. For example, claim 165, as currently amended, reads as follows (emphasis supplied):

Claims 165, 219, 273:

165. A computer implemented method for relating a price or value of a plurality of securities associated with an underlying asset, a rate of return on said securities and risk attributes of said securities, the method comprising the steps of:

determining a risk premium incorporated in the rate of return for each security;

designating that a priced risk factor incorporated in the risk premium for each security is volatility, measured over discrete time, and that a price per unit of this risk factor is the same for two or more of the said securities; and

defining a financial model representing at least one relationship between the risk premiums determined for each security, and
storing the financial model in a computer memory.

Claims 219 and 273 include similar recitations.

In the second group of claims, claim 209 is directed to a computer implemented method, claim 263 is directed to a system, and claim 317 is directed to a computer readable medium. Each of the independent claims in this group recites

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an option-theoretic model of a firm, generating risk parameters from the model, estimated over a discrete time period, and solving the model so that the value of these parameters equal user specified values. For example, claim 209, as currently amended, reads as follows (emphasis supplied):

Claims 209, 263, and 317:

209. A computer implemented method for applying an option-theoretic model of a firm comprising the steps of specifying values for risk parameters, determining a plurality of input parameters, defining relationships between said input parameters, creating a computer implemented option-theoretic model of the firm, inputting the input parameters to the model, estimating one or more risk parameters from the model, measured over a discrete time period, solving the model so that the estimated risk parameters equal the values specified by a user, and storing the solution to the model in a computer memory.

Claims 263 and 317 include similar recitations.

Applicant reviews prior art, starting pg. 107 of Remarks:

II. The Prior Art Cited in the Office Action

Claims 165-168, 185, 187-189, 191, 195-197, 199, 202-203, 209-222, 239, 241-243, 245, 249-251, 253, 256-257, 263-265, 267, 269-276, 293, 295-297, 299, 303-305, 307, 310-311, 317-327, 331-332, 336-337, 341-342, 346-347, 351-352, 356-357, 361-362, 366-367 and 371 stand rejected as being unpatentable over the combination of Sandretto in view of Pang et al.

Applicant notes that the Office has not provided any analysis of claims 212, 214, 320 or 322 over the combination of Sandretto and Pang et al., and submits that, as such, the Office has not established a prima facie determination of obviousness, pursuant to MPEP 2141.

Noted.

In addition, claims 169-170, 223-224, and 277-278 stand rejected over Sandretto in view of Pang in further in view of Erlach et al.

In addition, claims 183-184, 204, 206, 237-238, 258, 260, 291-292, 312, and 314 stand rejected over Sandretto in view of Pang and further in view of Hunealt.

In addition, claims 186, 205, 207-208, 240, 259, 261-262, 294, 313, and 315-316 stand rejected over Sandretto in view of Pang and further in view of Lipton et al.

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In addition, claims 190, 192, 244, 246, 298, and 300 stand rejected over Sandretto in view of Pang and further in view of Sant.

Sandretto discloses, as prior art, the capital asset pricing model (CAPM). Under this model the risk measure is "beta," which is multiplied by a market risk premium and added to a risk free rate in order to arrive at an expected rate of return for an asset. Sandretto discloses that different risk premia can be used for different asset classes, such as US stocks or UK Treasury securities. Sandretto discloses a "default risk premium" for debt. Sandretto discloses correlation between variables, as an input.

Pang discloses a volatility calculator in an apparatus and method for pricing financial derivatives.

Erlach et al. disclose that a junk bond yield includes a default rate premium and that a required stock yield must incorporate a greater default risk premium.

Hunealt discloses topographical mapping of insurance in relation to options.

Lipton et al. disclose analysis of default in accordance with Zhou's model.

Sant discloses calculation of portfolio risk and return measures, one of which is the covariance of a pair of stocks in a portfolio.

Applicant argues 35 USC 103(a) rejection, starting pg. 108 of Remarks:

III. The Rejection Under Section 103(a) is Improper
Applicant will now explain why the rejections under Section 103(a) should be withdrawn. As discussed below, Applicant respectfully requests that the Office consider four high-level reasons for overturning the rejections: (1) There are substantial differences between Applicant's claimed invention and the cited combination of Sandretto in view of Pang; (2) the prior art teaches away from Applicant's claimed invention; (3) Applicant's claimed invention yields unexpected results; and (4) the rationale advanced by the Office for rejecting the claims based on the combined teachings of Sandretto and Pang et al. is conclusory and legally deficient. Applicant respectfully requests that the Office reconsider the rejections.

Differences Between the Claimed Invention and the Prior Art

The Office states that "Beta is the volatility of the return," and also that "Sandretto teaches beta, he does not teach "volatility." Official Action, at 19. Applicant respectfully disagrees with the first statement. Beta is not the volatility of returns, and Sandretto does not teach this. Sandretto, rather, teaches beta in the CAPM

context, as known in the art.

Applicant argues beta is not volatility.

Sandretto teaches use of a market-wide risk premium, or a risk premium for asset classes (such as US stocks or corporate stocks). Applicant's invention teaches use of risk premia (or the price per unit of a risk factor) that are specific to a single underlying asset and the securities associated with that asset.

From above...

>>Applicant's invention teaches use of risk premia (or the price per unit of a risk factor) that are specific to a single underlying asset and the securities associated with that asset.<<

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., "single underlying asset") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Sandretto teaches the use of beta, not volatility, as the priced risk measure. Applicant's invention teaches the use of volatility, measured over discrete time, as a risk measure.

With all due respect, applicant's invention teaches expected returns are measured over time.

"In particular, in the case of the price of the risk of volatility of expected returns, measured over discrete time, the price of risk (i.e. the volatility risk premium) is the same for all firm (or asset) specific securities." [0014] (Pub. No. US 2009/0106133)

In the same sense, Sandretto teaches volatility measured over time. Beta as taught by Sandretto is determined by returns on asset.

Pang et al. teaches the use of an implied volatility calculator. Pang et al. states, "The basic framework of the forward pricing program is that of Black and Scholes..." Pang, at col. 5, lines 53-54. The Black-Scholes framework is that of a risk neutral world, that is there is no risk premium included in the Black-Scholes option pricing model. Pang et al. present several formula in the specification and in the claims where the rate of return used to calculate implied volatility is "r",

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which they define as the risk-free interest rate. Pang et al. do not teach use of risk premia, either on a market-wide or asset-specific basis.

From above...

>>Pang et al. do not teach use of risk premia, either on a market-wide or asset-specific basis.<<

Sandretto teaches risk premia and beta. Pang et al. was simply used to literally teach volatility.

Claim 165 reads on a CAPM. Applicant is arguing that because they are applying a CAPM to an individual firm, their claim is novel. With all due respect to the Applicant, their invention is about using a CAPM model for an individual firm, Claim 165 does not recite those limitations that distinguish it from a CAPM.

Applicant argues claim 209:

Neither Sandretto nor Pang et al. teach the use of an option-theoretic model of the firm.

Respectfully, any option-theoretic model reads on claim 209. Claim 209 is very broad and abstract.

Where Sandretto teaches a "default premium" for debt issues or bond, no distinction is made between an expected default loss and a risk premium for such debt issues. In Applicant's specification and claims, this is an important distinction that is made in analysing all debt issues or bonds. Refer, for example, to the instant specification at [0037], and [0039], and claim 166.

Sandretto teaches the use of means, correlations and statistical distributions of economic variables as inputs to a system. By contrast, Applicant's invention uses means and correlations to solve or fit models. Furthermore, Applicant's invention can be practised using higher statistical moments, such as skewness and kurtosis, to solve or fit models.

Erlach et al. teaches incorporation of a default risk premium in a required stock yield. Applicant's invention does not incorporate a default risk premium in a required stock yield. Applicant's invention makes a distinction between an expected default loss and a risk premium when used to analyse debt-type securities.

Erlach et al. teach that at-risk bonds cannot yield more than treasuries in real, after-tax terms in the aggregate, and after defaults net of recoveries and related costs. Applicant's invention teaches that risky debt-type securities earn a risk premium above a risk free rate (such as treasuries), after allowing for expected

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default losses. Refer, for example, to the instant specification at [0037], and [0039], and claim 166.

Hunealt teaches a method for the topographical mapping of investment risk. This mapping method is unrelated to Applicant's invention. Hunealt applies topographical mapping method to options, but in doing so merely uses the Black-Scholes risk neutral option valuation framework that is known in the art and referred to in Applicant's specification. Refer, for example, to the instant specification at [0003].

Lipton et al. teaches default using Zhou's model. This model is implemented in the Black-Scholes risk neutral framework. Lipton et al. uses a risk free interest rate (r) in its application, where it is variously referred to as "the risk free interest rate" (Lipton, at [0011]), "the risk neutral rate" (Lipton, at [0045] and [0065], and claims 1, 6, 11, 12, 22, and 32), and "the interest rate" (Lipton at [0103], [0113], and [0121], and claims 17, 18, 19, 26, 27, and 29). Lipton et al. does not teach use of risk premia, of volatility as a priced risk factor, or of expected loss given default.

Sant teaches analysis of the covariance between pairs of stocks as an intermediate step to calculating the variance of a portfolio. Applicant's invention is not directed to portfolio risk analysis. Applicant's invention uses the covariance between a security and the underlying firm to which it is referenced, or between pairs of securities referenced to the same firm in order to fit models.

Accordingly, for the reasons set forth above, Applicant requests that the rejection of the inventions described in the instant claims based on the combination of Sandretto in view of Pang be withdrawn.

Respectfully, It is unclear what claims are being addressed above. Applicant is arguing the prior art does not apply to their invention. Applicant is reminded that while claims interpreted in light of the specification, limitations are not into the claims. The claims need to provide the above limitations. Specific claims should be cited with the limitation in the claim that reads over the prior art.

The Prior Art Teaches Away

Sandretto teaches use of the CAPM, a model known in the art. The teachings of the CAPM model are that the total risk of an asset, as measured by its volatility, is not relevant for asset pricing. Instead it is only the systematic component of risk, as measured by beta, that is relevant for asset pricing. The rationale in the art is that by holding a diversified portfolio investors can virtually eliminate their exposure to non-systematic risk. It is taught that investors should not expect any reward for bearing non-systematic risk. Accordingly, it is submitted that the

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CAPM prior art, as cited in Sandretto, teaches away from use of total volatility as a priced risk measure.

What claim(s) is applicant arguing?

In discussing the CAPM equation, Elton and Gruber, Modern Portfolio Theory and Investment Analysis, 5th edition, 1995, states at 301:

One of the greatest insights that comes from this equation arises from what it states is unimportant in determining return. Recall that in Chapter 7 we saw that the risk of any stock could be divided into systematic and unsystematic risk. Beta was the index of systematic risk. This equation validates the conclusion that systematic risk is the only important ingredient in determining expected returns and that non-systematic risk plays no role.

Additionally, in Brealey and Myers, Principles of Corporate Finance, international student edition, 1981, states at 127:

If we want to know the contribution of an individual security to the risk of a well-diversified portfolio, it is no good thinking about how risky that security is if held in isolation - we need to measure its market risk and that boils down to measuring how sensitive it is to market movements. The sensitivity of an investment's return to market movements is usually called its beta (β).

Pang et al. teaches use of the Black-Scholes option pricing framework, which is based on an assumption of "risk neutrality." The teachings of this framework in the art are that it is unnecessary, and indeed extremely difficult, to include a risk premium in the analysis of options. The Black-Scholes prior art thus teaches away from inclusion of risk premia. The instant specification at [0008] includes the following quote from a press release at the time two of the three academics behind the Black-Scholes framework received Nobel Prizes in economics:

The value of an option to buy or sell a share depends on the uncertain development of the share price to the date of maturity. It is therefore natural to suppose-as did earlier researchers-that valuation of an option requires taking a stance on which risk premium to use, in the same way as one has to determine which risk premium to use when calculating present values in the evaluation of a future physical investment project with uncertain returns. Assigning a risk premium is difficult, however, in that the correct risk premium depends on the investor's attitude towards risk.

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Whereas the attitude towards risk can be strictly defined in theory, it is hard or impossible to observe in reality.

In discussing the Black-Scholes option pricing formula, Brealey and Myers states at

For our purposes the precise formula is less important than the terms that appear in it. Notice that the willingness of individuals to bear risk does not affect value, nor does the expected return on the stock.

Additionally, Elton and Gruber states at 589:

Perhaps the most interesting aspect of the Black-Scholes model is a variable that does not appear as a determinant of the value of a call. This variable is the expected rate of return on the stock.

Additionally, Chance, An Introduction to Derivatives, 3rd edition, 1995, states at 7:

While most individuals are indeed risk averse, it may surprise you to find that in the world of derivative markets, we can actually pretend that most people are risk neutral. No, we are not making some heroic but unrealistic assumption. It turns out that we obtain the same results in a world of risk aversion as we do in a world of risk neutrality.

Additionally, Hull, Options, Future and Other Derivatives, 5th edition, 2002, states at 244- 245:

We introduced risk-neutral valuation in connection with the binomial model in Chapter 10. It is without doubt the single most important tool for the analysis of derivatives. It arises from one key property of the Black-Scholes-Merton differential equation (12.15). This property is that the equation does not involve any variable that is affected by the risk preferences of investors.

Respectfully, arguments need to be specific and directly related to specific, cited claims.

Unexpected Results

The prior art on the Black-Scholes framework teaches that even if risk premia were included in an option pricing model, the resulting option values, across different strike prices, would still be the same as under the risk-neutral Black-Scholes framework. An unexpected result of Applicant's invention is that different option values are obtained for different option strike prices and a single volatility input than from under the risk-neutral Black-Scholes framework. This may be

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seen, for example, in figure 9 of the instant specification. Applicant's invention is thus able to, at least in part, solve the volatility smile problem known in the art and illustrated in figure 8 of Applicant's specification. This is an unexpected result from including risk premia in an option pricing framework.

In addition, the prior art of analysing an option-theoretic model of the firm in a risk neutral world has found that when using realistic parameters the model predicted credit spreads are too low. Applicant's incorporation of risk premia into an option-theoretic model of the firm is able to produce higher credit spreads that more closely align with those observed in the market. This is an unexpected result from including risk premia in an option-theoretic model of the firm.

Specific claims that include the above features need to be cited.

Defects with the Office's Rationale for Rejecting the Claims

In respect to the rejection of independent claims 165, 219 and 273, essential elements of Applicant's claims are not present in either Sandretto or Pang et al. These elements are that volatility, measured over discrete time, is a priced risk factor and that the price per unit of risk, for each priced risk factor, is the same for two or more securities issued by or referenced to the same underlying asset or firm. Furthermore, even if all of Applicant's features had been present in Sandretto and Pang, there would have been no motivation or suggestion to combine. The prior art teaches away from using risk premia in an option pricing model or an option-theoretic model of the firm and from treating total volatility as a priced risk factor. In addition, by introducing risk premia into an option pricing model or an option-theoretic model of the firm Applicant's invention produces unexpected results. In the former case the volatility smile can be explained and in the latter case more realistic credit spreads can be modelled.

Respectfully, the claims are so broad just about any art that teaches a CAPM reads on the claims. Sandretto alone teaches beta, which is volatility. Pang et al. was simply used to teach the word volatility, which was probably not required. The claims need to recite the features to distinguish the claims from the prior art.

In respect to the rejection of independent claims 209, 263 and 317, essential elements of Applicant's claims are not present in either Sandretto or Pang et al. These elements are application of an option-theoretic model of the firm and fitting such a model using risk parameters measured over discrete time. Furthermore, even if all of Applicant's features had been present in Sandretto and Pang, there would have been no motivation or suggestion to combine.

Respectfully, the amended claims require creating an option-theoretic model, which could be anything. Applicant's invention is not directed at creating models.

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The Office then concludes that:

It would have been obvious to one of ordinary skill in the art at the time of invention to use volatility as taught by Pang et al. since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

To support a combined-reference obviousness rejection, there must be a clearly articulated rationale for combining the prior art in a manner which meets the Applicant's claims. Indeed, as stated in MPEP § 2141, the key to supporting any rejection under Section 103 is "the clear articulation of the reason(s) why the claimed invention would have been obvious." Moreover, "rejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." Exemplary rationales that may support a conclusion of obviousness, as set forth in MPEP 2141, include those noted below in the margin. ~ Of these enumerated rationales that may support an obviousness rejection, the only one that could arguably correspond to the Office's combination of Sandretto and Pang are, "(A) Combining prior art elements according to known methods to yield predictable results," and "(G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention." In this case, however, the Official Action offers a deficient justification of the rejection. The simple assertion of,

It would have been obvious to one of ordinary skill in the art at the time of invention to use volatility as taught by Pang et al. since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

falls short of the required showing set forth in the MPEP, i.e., a "clear articulation of the reason(s) why the claimed invention would have been obvious" and "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." For example, under category (A), the office action is deficient because it lacks the necessary substantial (non- conclusory) showing of how Sandretto and Pang, when combined per claims 165, 209, 219, 263, 273, and 317, would yield predictable results, or what methods are known to perform such combining. Further, under category (G), the Official Action is lacking with respect to the required teaching, suggestion, or motivation that would have led one of ordinary skill to modify Sandretto or to combine Sandretto and Pang to

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arrive at the claimed invention. Thus, Applicant submits that a prima facie case of obviousness has not been established pursuant to MPEP 2141.

For these reasons, Applicant respectfully requests that the Office withdraw the rejections under 35 U.S.C. § 103(a). Applicant therefore respectfully requests reconsideration and withdrawal of the rejections of all claims that depend from the independent claims. Applicant reserves the right to challenge the rejection of any of those dependent claims in any future response that may be forthcoming.

The Examiner maintains the prior art rejection and will reconsider the above arguments pending resolution of the 35 USC §101 and 35 USC §112, 2nd para. rejections.

Claim Objections

5. Regarding claims 209, 263 and 317, the steps need to be indented:

Where a claim sets forth a plurality of elements or steps, each element or step of the claim should be separated by a line indentation. (MPEP 608.01(m))

See claim 165 as an example of a proper format.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. Claims 165-170 and 183-218 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Note: The following analysis of claims 165-170 and 183-218 is based on the revised PTO guidelines for patent eligible subject matter under 35 USC 101 after the

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Supreme Court ruling in *Bilski v. Kappos*, (June 28, 2010). *Interim Guidance for Determining Subject Matter Eligibility for Process Claims in View of Bilski v. Kappos*.

This guidelines emphasizes that M-O-T is not the sole test but that further analysis (if M-O-T fails) must be carried out to determine whether the claimed process is an abstract idea.

In the instant case, process claims 165 and 209 are not eligible as statutory process under the Interim Guidance. The Supreme Court has ruled that the Machine or Transformation test articulated below is a useful starting point for determining whether a claimed invention is a patent-eligible process:

the process claim is statutory if it (1) is tied to a machine or (2) creates or involves a composition of matter or manufacture.

However, absent M-O-T, a claimed method is nonetheless patent-eligible if it is NOT directed to an abstract idea.

Furthermore, the PTO guidance also states that a claim reciting involvement of machine (e.g. a computer) nominally, insignificantly or tangentially related to the performance of the steps, e.g. data gathering or post-solution activity do not meet the machine prong of the test.

In *Comiskey* (In re *Comiskey*) "the mere use of the machine to collect data necessary for application of the mental process may not make the claim patentable subject matter." *Comiskey*, 499 F.3d at 1380 (citing *In re Grams*, 888 F.2d 835,839-40 (Fed. Cir. 1989)). In other words, nominal or token recitations of structure in a method claim should not convert an otherwise ineligible claim into an eligible one. See *Diehr*,

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450 U.S. at 191-92 ("insignificant post- solution activity will not transform an unpatentable principle into a patentable process).

In the case of claims 165 and 209 of the instant application, step (d) of claim 165 and step (i) of claim 209 are treated as insignificant in 101 analysis since these steps are storing a result even if such process is carried out via a machine. On the other hand steps (a)-(e) of claim 165 and steps (a)-(i) of claim 209 may be performed by a human mind yielding subjective and unpredictable result and therefore directed to an abstract idea.

Dependent claims 166-170, 183-208 and 210-218 do not resolve the deficiency of independent claims 165 and 209 and accordingly stand rejected under 35 USC 101 based on the same rationale.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 165-170, 183-224, 237-278, and 291-326 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

9. Claim 165, step 1 has "determining a risk premium incorporated in the rate of return..." where it is indefinite as to how determining a risk premium in a rate of return is

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accomplished. How do you determine a risk premium in a rate of return? Claims 219 and 273 have the same problem.

10. Claim 165, step 2 has “designating that a price risk factor incorporated in the risk premium...is the volatility of returns” where it is indefinite as to how a price risk factor is designated. Designating is the same as defining, and this step tries to define a solution (risk factor is the same for two or more securities). It is indefinite as to how this is done. It is also indefinite as to how this step of designating relates to the prior step of determining a risk premium and the later step of defining a financial model. Claims 219 and 273 have the same problem.

11. Claim 165, step 3 has “defining a financial model representing at least one relationship between the risk premiums...” where it is indefinite as what financial model is (what is the scope of a financial model), how the model represents a relationship, and what a relationship between the risk premiums involves. Claims 219 and 273 have the same problem.

12. Claim 165, step 3 has “risk premiums determined for each security” where there is no antecedence for risk premiums (plural). Claims 219 and 273 have the same problem.

13. Claim 165, step 4 has “storing the financial model” where it is indefinite as to how a model is stored. This is interpreted to mean some type of equation that represents a model stored in memory. This step simply stores an equation. Claim 219 has the same problem.

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14. Claim 169 recites the limitation "the product of the risk exposures" in the calculating a price per unit step. There is insufficient antecedent basis for this limitation in the claim. Claims 223 and 277 have the same problem.

15. Claim 206 recites the limitation "the returns on the firm..." There is insufficient antecedent basis for this limitation in the claim. Claim 314 has the same problem.

16. Claim 209 and 317 have "specifying values for risk parameters" where it is indefinite as to how the values are specified (e.g. arbitrarily by a person). Further it is indefinite as to why multiple values are specified for multiple risk factors. One risk parameter could have multiple values for example. Claim 263 has a similar problem of receiving specified values.

17. Claims 209 and 317 has "determining a plurality of input parameters" where it is indefinite as to how determining input parameters is accomplished and what the input factors are. A person could determine in their mind what an input parameters is, and it could be anything, not even a number. Claim 263 has a similar problem of receiving input parameters, which could be anything.

18. Claims 209 and 317 have "defining relationships between said input parameters" which is indefinite as anything could be defined as a relationship (e.g. the parameters are integers).

19. Claims 209 and 317 have "creating a computer implemented option-theoretic model of the firm" which is indefinite since creating is the same as generating and it is indefinite as to how a model is generated or created. Further, it is indefinite as to what

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the model involves. There are no limitations as to what the model is so just about any model would could be created and called an option-theoretic model.

20. Claims 209 and 317 have “inputting the input parameters to the model” where it is indefinite as to how input parameters are input into the model. Is the model an equation with variables, and numbers are input into the equation?

21. Claims 209 and 317 have “estimating one or more risk parameters form the model” where it is indefinite as to how estimating is accomplished by the model.

22. Claims 209 and 317 have “solving the model” where it is indefinite as to how the model is solved. Claim 263 has a similar problem.

23. Claims 209 and 317 have “storing the solution” where there is no antecedence for “the solution.”

24. Claim 263 has “when the system is operational” which is indefinite as to when this happens. This is ignored.

25. Claim 263 has “when executed on a processor” where antecedence is provided for a processor. This should be “when executed by the processor.”

26. Claim 263 has “estimating one or more risk parameters...from said option-theoretic model...” where it is indefinite as to how the model estimates.

27. Claim 263 has “defining an option-theoretic model of a firm” where defining a model is indefinite since any model could be defined as an option-theoretic model.

28. Dependent claims 166-170, 183-208, 210-218, 220-224, 237-262, 264-272, 274-278, 291-316, and 318-326 are rejected because they depend from their respective independent claim.

Claim Rejections - 35 USC § 103

29. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

30. Claims 165-168, 185, 187-189, 191, 195-197, 199, 202-203, 209-214, 219-222, 239, 241-243, 245, 249-251, 253, 256-257, 263-268, 273-276, 293, 295-297, 299, 303-305, 307, 310-311, 317-322 rejected under 35 U.S.C. 103(a) as being unpatentable over Patent No. US 5,812,988 to Sandretto in view of Patent No. US 6,546,375 to Pang et al.

Regarding claims 165, 219 and 273:

(claim 165) A computer implemented method for relating a price or value of a plurality of securities associated with an underlying asset, the rate of return on said securities and the risk attributes of said securities, the method comprising the steps of:
determining a risk premium incorporated in the rate of return for each security;

Sandretto teaches:

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“(4) determine an initial input risk measure for each asset based on a risk-return type asset pricing model; (5) determine an initial discount rate for each asset using the initial input risk measure for each asset and using different economic variables that relate to each set of cash flows (for example, the risk-free rate and the market risk premium which are typically different for each set of cash flows); (col. 8, line 67 and col. 9, lines 1-7) Therefore a market risk premium is part of an input risk measure.

designating that a priced risk factor incorporated in the risk premium for each security is the volatility of returns, measured over discrete time, and that the price per unit of this risk factor is the same for two or more of the said securities; and

Sandretto teaches col. 4, lines 20-35:

$$(1) E(\tilde{R}_i) = R_f + \beta_i \times [E(\tilde{R}_m) - R_f]$$

for $i=1 \dots N$, where n is an integer equal to the number of assets, and

where:

$E(\tilde{R}_i)$ = the expected value of the return from investing in asset i

R_f = the return from investing in a risk-free asset (typically 30-day U.S. Treasury bills)

β_i = the risk measure for firm i

$E(\tilde{R}_m)$ = the expected value of the return from investing in the market (typically the expected return to investing in some market index, such as the New York Stock Exchange [NYSE] Index™, or the S&P 500 Index)

The risk factor β is for the same firm i .

$$(2) R_{it} = R_{ft} + \beta_i \times (R_{mt} - R_{ft})$$

where:

R_{it} = the actual return from investing in asset i during a prior period t

R_{mt} = the actual return from investing in the market portfolio during a prior period t

R_{ft} = the actual risk-free rate during a prior period t

β_i = the slope coefficient derived by regressing R_{it} against R_{mt}

Therefore, risk over time is determined.

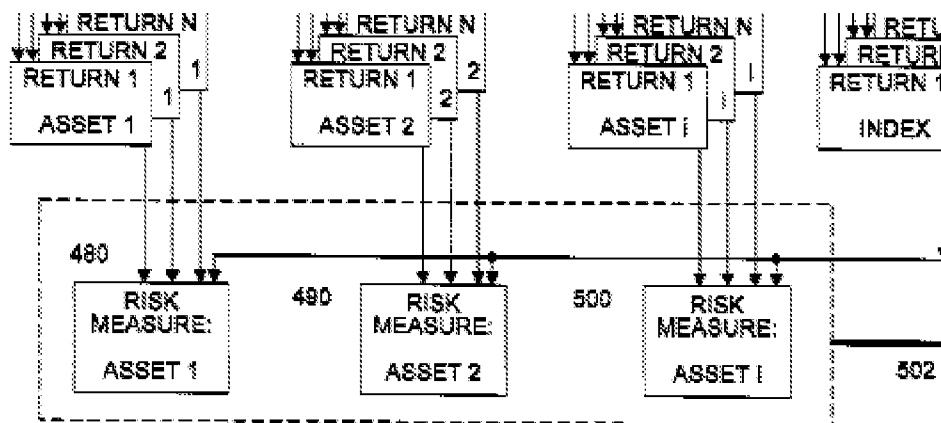
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“Using the statistical process of ordinary least squares regression, regress the returns for GM stock against the returns for the market index. The resulting regression yields a risk measure for General Motors stock. That risk measure, the slope of the regression line, is usually called beta (.beta.). The estimated .beta.” (col. 5, lines 9-14) Beta is the volatility of the return.

See Volatility below.

defining a model comprising data representing relationships between the risk premiums determined for each security.

Fig. 3 teaches risk measures and returns for different assets:



“(4) a risk premium or premiums for one or more asset classes based on the risk premium or premiums for one or more other asset classes;” (col. 3, lines 33-35)

Volatility

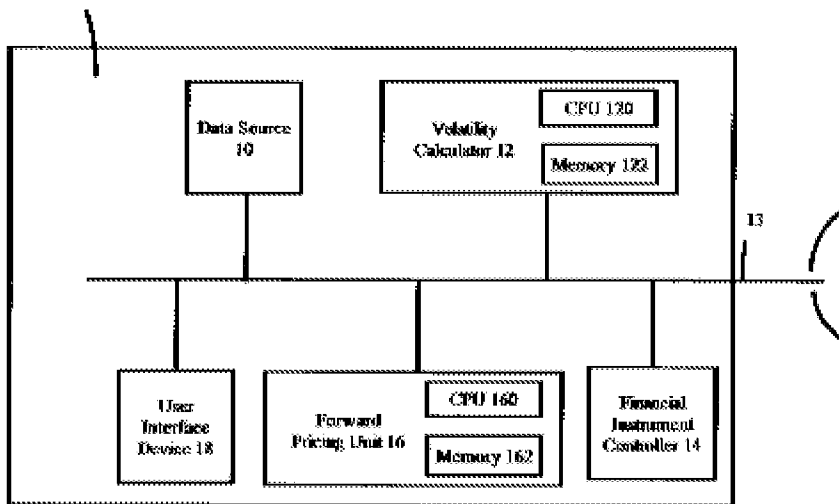
Sandretto teaches beta, he does not teach “volatility.”

Pang et al. teaches:

“In a preferred embodiment, financial engine 100 is composed of a plurality of modules: data source 10, implied volatility calculator 12, financial instrument controller 14, forward pricing unit 16, and user interface device 18.”

Fig. 1:

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It would have been obvious to one of ordinary skill in the art at the time of invention to use volatility as taught by Pang et al. since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

Regarding claims 166, 220, and 274:

(claim 166) The computer implemented method of claim 165, wherein at least one of said plurality of securities is a debt-type instrument, and further comprising analysing a yield spread associated with the debt-type instrument and identifying a default loss component and a risk premium component of said yield spread.

Sandretto teaches:

“5) a default premium for one or more specific debt issues;” (col. 3, lines 34-37) Inherent with risk premium is yield spread, where spread consists of the premium.

Regarding claims 167, 221 and 275:

(claim 167) The computer implemented method of claim 165, further comprising fitting the model.

Sandretto teaches:

“More specifically, this invention relates to an iterative process to estimate a discount rate for each of two or more assets. This invention relates to similar iterative processes to estimate other variables or coefficients that are useful in estimating an asset's risk or NPV.” (col. 3, lines 23-29)
Therefore an iterative process solves (fits) the variables to the equations.

Regarding claims 168, 222 and 276:

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(claim 168) The computer implemented method of claim 167, further comprising providing as output to a user parameters of the fitted model.

Sandretto teaches:

“FIG. 3 is a schematic drawing of how different estimates for economic variables are used to estimate projected cash flows for each asset, how those cash flows are used to determine NPVs for each asset and for an index, how NPVs are used to determine simulated returns, how simulated returns are used to determine output risk measures, and how the iterative process is used to re-estimate NPVs and asset values;” (col. 13, lines 1-8)

Regarding claims 185, 239, and 293:

(claim 185) The computer implemented method of claim 165, wherein a user applies an option-theoretic model of the firm, the method further comprising the steps of: determining a plurality of input parameters, the parameters including a risk premium in the rate of return for each security issued by, or referenced to, the firm;

Sandretto teaches:

“However, unlike the iterative process for asset risk measures and for the risk premium, this difference cannot be reduced to an arbitrarily small amount, only to a minimum value that depends upon various input parameters and market prices for individual assets. Typically, but not in all cases, selecting a new .beta. that is between the input .beta. and the output .beta. will assure that the process will converge, as desired.” (col. 18, lines 2-8)

defining relationships between said parameters;

“For example, the risk-free rate may be expected to fluctuate or vary somewhat randomly over time, but more significant changes over time may be dependent on another variable, such as inflation. Such a model may be defined as the distribution of each economic variable, or alternatively, in combination with a relationship between one or more of the economic variables used in the process.” (col. 19, lines 37-40)

fitting the model; and

**“More specifically, this invention relates to an iterative process to estimate a discount rate for each of two or more assets. This invention relates to similar iterative processes to estimate other variables or coefficients that are useful in estimating an asset's risk or NPV.” (col. 3, lines 23-29)
Therefore an iterative process solves (fits) the variables to the equations.**

providing as output to a user parameters of interest from the fitted model.

“FIG. 3 is a schematic drawing of how different estimates for economic variables are used to estimate projected cash flows for each asset, how those cash flows are used to determine NPVs for each asset and for an

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index, how NPVs are used to determine simulated returns, how simulated returns are used to determine output risk measures, and how the iterative process is used to re-estimate NPVs and asset values;" (col. 13, lines 1-8)

Regarding claims 187, 241 and 295:

(claim 187) The computer implemented method of claim 185, further comprising the steps of:

defining additional multi-variate equations representing relationships between some or all of the variables used in the model of claim 185; and

Sandretto teaches:

"Thus the asset models 20, which may be comprised of look-up tables for the data elements or other data structures (meaning herein physical relationships among the stored data elements) stored in RAM 4 and/or data storage device 8. These data structures together with associated program instructions, specify and/or prompt the user to input information required in Step 10." (col. 16, lines 56-63)

solving all of the multi-variate equations and the said model to calculate the remaining unknown variables in the equations and the model.

"Economic information, such as the risk-free rate and the current rate of inflation, is entered in the same interactive manner in Step 30. According to a preferred embodiment of the invention, the particular economic information input in Step 30 is specified with reference to one of several predetermined economic models 40 which may be comprised of look-up tables or similar physical data structures. In Step 50, several sets of cash flows are determined for a specified number of periods, such as each of the next twenty quarters, for each asset under various economic conditions. The cash flows determined in Step 50 are preferably determined with reference to one of several predetermined asset cash flow models 60." (col. 16, lines 67 and col. 17, lines 1-12)

Regarding claims 188, 242 and 296:

(claim 188) The computer implemented method of claim 187, wherein at least one of the unknown inputs included in one or more additional multi-variate equations comprises or represents a statistical moment of one of the securities issued by, or referenced to the firm.

Sandretto teaches:

"In Step 560 the user enters into computer system 1 the current estimate for each economic variable (i.e., the mean), the statistical distribution (assuming that the revised sets of economic variables are to be randomly generated using statistical methods), and any correlations between variables." (col. 25, lines 63-67, and col. 26, line 1)

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Regarding claims: 189, 243, 297; and claims 191, 245 and 299:

(claim 189) The computer implemented method of claim 187, wherein at least one of the unknown inputs included in one or more additional multi-variate equations comprises or represents the correlation between the returns of a pair of securities issued by, or referenced to, the firm.

(claim 191) The computer implemented method of claim 187, wherein at least one of the unknown inputs included in one or more additional multi-variate equations comprises or represents the correlation between the returns of a security issued by, or referenced to, the firm and the returns of the total firm.

Sandretto teaches:

“In Step 560 the user enters into computer system 1 the current estimate for each economic variable (i.e., the mean), the statistical distribution (assuming that the revised sets of economic variables are to be randomly generated using statistical methods), and any correlations between variables.” (col. 25, lines 63-67, and col. 26, line 1)

“In Step 600 the user enters the number of debt instruments, or bonds, to be evaluated.” (col. 26, lines 25-26)

Regarding claims: 195, 249 and 303

(claim 195) The computer implemented method of claim 187, wherein at least one of the unknown inputs included in one or more additional multi-variate equations comprises or represents the expected default loss on a debt-type security issued by, or referenced to, the firm.

Sandretto teaches:

“(4) equate the default risk premium for corporate debt with the default risk premium as implied by the likelihood of default under various economic outcomes;” (col. 12, lines 41-44)

Regarding claims 196, 250 and 304:

(claim 196) The computer implemented method of claim 185, further comprising the steps of generating one or more parameters from the model and solving the model so that the said parameters equal values specified by a user, where one of the said parameters is a statistical moment of the returns of one of the securities issued by, or referenced to, the firm.

Sandretto teaches:

“In Step 560 the user enters into computer system 1 the current estimate for each economic variable (i.e., the mean), the statistical distribution (assuming that the revised sets of economic variables are to be randomly generated using statistical methods), and any correlations between variables.” (col. 25, lines 63-67, and col. 26, line 1)

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“(4) equate the default risk premium for corporate debt with the default risk premium as implied by the likelihood of default under various economic outcomes;” (col. 12, lines 41-44)

Regarding claims 197, 251 and 305:

(claim 197) The computer implemented method of claim 185, further comprising the steps of generating one or more parameters from the model and solving the model so that the said parameters equal values specified by a user, where one of the said parameters is the correlation between the returns of a pair of securities issued by, or referenced to, the firm.

Sandretto teaches:

“In Step 560 the user enters into computer system 1 the current estimate for each economic variable (i.e., the mean), the statistical distribution (assuming that the revised sets of economic variables are to be randomly generated using statistical methods), and any correlations between variables.” (col. 25, lines 63-67, and col. 26, line 1)

“In Step 600 the user enters the number of debt instruments, or bonds, to be evaluated.” (col. 26, lines 25-26)

Regarding claims 199, 253, 273, and 307:

(claim 199) The computer implemented method of claim 185, further comprising the steps of generating one or more parameters from the model and solving the model so that the said parameters equal values specified by a user, where one of the said parameters is the correlation between the returns of a security issued by, or referenced to, the firm and the returns of the total firm.

Sandretto teaches:

“The present invention relates to computer implemented processes for estimating simulated returns, asset values and risk measures using estimated financial variables pertaining to an asset, such as economic variables and asset-specific characteristics.” (col. 1, lines 11-15)

Regarding claims: 202, 256, 310; and claims 203, 257 and 311:

(claim 202) The computer implemented method of claim 185, further comprising the steps of generating one or more parameters from the model and solving the model so that the said parameters equal values specified by a user, where one of the said parameters is the expected loss given default on a debt-type security issued by, or referenced to, the firm.

(claim 203) The computer implemented method of claim 185, further comprising the steps of generating one or more parameters from the model and solving the model so that the said parameters equal values specified by a user, where one of the said parameters is the expected default loss on a debt-type security issued by, or referenced to, the firm.

Sandretto teaches:

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“(4) equate the default risk premium for corporate debt with the default risk premium as implied by the likelihood of default under various economic outcomes;” (col. 12, lines 41-44)

Regarding claims: 209, 263, 317:

(claim 209) A computer implemented method for applying an option-theoretic model of a firm comprising the steps of generating one or more risk parameters from the model, estimated over a discrete time period, and solving the model so that the said parameters equal values specified by a user.

Sandretto teaches:

“If in Step 162 the measure of the difference between the value of each of the bonds and their market value is less than a predetermined amount, the process continues at Step 170 where the risk measure determined by the process may be printed or otherwise displayed to the user, with other useful information including asset prices, estimated inflation, estimated risk premiums, estimated standard deviations for each bond (which may be useful for evaluating options) and, if desired, over and under valued assets.” (col. 18, lines 41-49)

Regarding claims 210, 264 and 318:

(claim 210) The computer implemented method of claim 209, wherein one of the said risk parameters is a statistical moment of the returns of one or more of the securities issued by, or referenced to, the firm.

Sandretto teaches:

“If in Step 162 the measure of the difference between the value of each of the bonds and their market value is less than a predetermined amount, the process continues at Step 170 where the risk measure determined by the process may be printed or otherwise displayed to the user, with other useful information including asset prices, estimated inflation, estimated risk premiums, estimated standard deviations for each bond (which may be useful for evaluating options) and, if desired, over and under valued assets.” (col. 18, lines 41-49)

Regarding claims 211, 265 and 319:

(claim 211) The computer implemented method of claim 209, wherein one of the said risk parameters is the correlation between the returns of a pair of securities issued by, or referenced to, the firm.

Sandretto teaches:

“In Step 560 the user enters into computer system 1 the current estimate for each economic variable (i.e., the mean), the statistical distribution (assuming that the revised sets of economic variables are to be randomly generated using statistical methods), and any correlations between variables.” (col. 25, lines 63-67, and col. 26, line 1)

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“In Step 600 the user enters the number of debt instruments, or bonds, to be evaluated.” (col. 26, lines 25-26)

Regarding claims 213, 267 and 321:

(claim 213) The computer implemented method of claim 209, wherein one of the said risk parameters is the correlation between the returns of a security issued by, or referenced to, the firm and the returns of the total firm.

Sandretto teaches:

“The present invention relates to computer implemented processes for estimating simulated returns, asset values and risk measures using estimated financial variables pertaining to an asset, such as economic variables and asset-specific characteristics.” (col. 1, lines 9-15)

31. Claims 169-170, 223-224, and 277-278 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined references in section (30) above in further view of Pub. No. 2005/0080704 to Erlach et al.

Regarding claims 169, 223 and 277:

(claim 169) The computer implemented method of claim 165, wherein the rate of return for a security (or securities) issued by, or referenced to, a firm is analysed utilising an estimate of the expected default loss of another, debt-type security (security j) issued by, or referenced to, the firm, the method further comprising the steps of: determining the rate of return on security j (r_j) by reference to the promised yield on said security (y_j) and the expected default loss (EDL_j) on said security where:
$$r_j = y_j - EDL_j$$

See Default below

calculating the excess return for said security j as equal to $r_j - r$, where r is the risk free rate of return;

See Default below

calculating the exposure of each security to each priced risk factor (m);

Sandretto teaches:

“By regressing returns for an index of simulated corporate stock returns against the index of simulated U.S. Treasury security returns, it is possible to estimate a corporate stock risk premium. This may be a particular advantage since current methods of comparing the price of corporate stocks with the price of U.S. Treasury securities probably rely more on judgement and on statistics than on formal risk-return analysis;” (col. 12, lines 33-40)

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calculating a price per unit of risk (λ_m) for each priced risk factor (m) in which each λ_m is the same for two or more securities issued by, or referenced to, the firm and such that the product of the risk exposures for security j and the prices per unit of risk equals the excess return for security j, and similarly for any other security for which an estimate of the excess return is available;

Sandretto teaches:

“(3) equate the risk premium for one or more asset classes, such as U.S. stocks or U.K. Treasury securities (or risk factors in the APT) with the risk premium implied by: the relation between that asset class and the risk premium from an asset class believed to be efficiently priced, such as U.S. Treasury securities.” (col. 12, lines 18-24) In this manner, the risk factor is the same.

designating that one of the priced risk factors relates to the volatility of the rate of return on securities estimated over a discrete time period and is specific to securities issued by, or referenced to, the firm;

Sandretto teaches:

“Using the statistical process of ordinary least squares regression, regress the returns for GM stock against the returns for the market index. The resulting regression yields a risk measure for General Motors stock. That risk measure, the slope of the regression line, is usually called beta (.beta.). The estimated .beta.” (col. 5, lines 9-14) Beta is a risk measure of the volatility of the return.

calculating the excess rate of return for all of the other securities being analysed, other than j, based at least partly on their exposure to each priced risk factor and the price per unit of risk for each risk factor;

Sandretto teaches:

“According to another embodiment, the Sharpe-Lintner model may be implemented using only two simulated returns for each bond, or only one simulated return for each bond based upon the assumption that the origin is a second point, i.e., a 0.0% excess return for an asset and 0.0% excess return for the index (0.0% in excess of R_f). In either of these simplified methods simple division can replace linear regression as a technique to determine a bond's risk measure.” (col. 20, line 67 and col. 21, lines 1-8)

fitting the model; and

Sandretto teaches:

“More specifically, this invention relates to an iterative process to estimate a discount rate for each of two or more assets. This invention relates to similar iterative processes to estimate other variables or coefficients that are useful in estimating an asset's risk or NPV.” (col. 3, lines 23-29) Therefore an iterative process solves (fits) the variables to the equations.

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providing as output to a user parameters of interest from the fitted model.

Sandretto teaches:

“FIG. 3 is a schematic drawing of how different estimates for economic variables are used to estimate projected cash flows for each asset, how those cash flows are used to determine NPVs for each asset and for an index, how NPVs are used to determine simulated returns, how simulated returns are used to determine output risk measures, and how the iterative process is used to re-estimate NPVs and asset values;” (col. 13, lines 1-8)

Default

The combined references teach risk premium. They do not teach default.

Erlach et al. teaches

“Just as a junk bond yield includes a default rate premium in addition to a term-adjusted risk-free rate; a required stock yield must incorporate a default risk premium greater than the debt grade for the same risk class since equity comes after debt in recovery.” [0109]

“Just as a junk bond yield includes a default rate premium in addition to a term-adjusted risk-free rate; a required stock yield must incorporate a default risk premium greater than the debt grade for the same risk class since equity comes after debt in recovery.” [0109]

It would have been obvious to one of ordinary skill in the art at the time of invention to include with asset analyses of the combined references default analyses as taught by Erlach et al. since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

Regarding claims 170, 224 and 278:

(claim 170) The computer implemented method of claim 169, wherein the only priced risk factor comprises the volatility of returns and is implemented by: designating the relationship between the firm specific price of volatility risk ($\lambda\sigma$), the rate of return for j (r_j), the volatility of returns for j (σ_j) and the risk free rate of return (r) as:

$$\lambda\sigma = (r_j - r)/\sigma_j$$

Sandretto teaches:

“For example, the risk-free rate may be entered as 3.0% annually, with an expected standard deviation over a 30-day period of 0.4%.” (col. 19, lines 26-29)

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designating the rate of return (r_k) on another class, or classes, of security (k) issued by, or referenced to, the firm as:

$$r_k = r + \lambda \sigma$$

“Assuming that the estimated inflation rates and the estimated returns to the market are correct, the process has determined a value for each asset and the riskiness .beta. for each asset.” (col. 11, lines 51-55)

designating, where security class or classes k are debt-type securities, the default loss on said securities by combining the promised yield on said securities (y_k) and their rate of return (r_k) as follows:

$$EDL = y_k - r_k$$

See Default below.

fitting the model; and

Sandretto teaches:

“FIG. 3 is a schematic drawing of how different estimates for economic variables are used to estimate projected cash flows for each asset, how those cash flows are used to determine NPVs for each asset and for an index, how NPVs are used to determine simulated returns, how simulated returns are used to determine output risk measures, and how the iterative process is used to re-estimate NPVs and asset values;” (col. 13, lines 1-8)

providing as output to a user parameters of interest from the fitted model.

“FIG. 3 is a schematic drawing of how different estimates for economic variables are used to estimate projected cash flows for each asset, how those cash flows are used to determine NPVs for each asset and for an index, how NPVs are used to determine simulated returns, how simulated returns are used to determine output risk measures, and how the iterative process is used to re-estimate NPVs and asset values;” (col. 13, lines 1-8)

Default

The combined references teach risk and volatility. They do not teach default.

Erlach et al. teaches

“Note that at-risk bonds cannot yield more than treasuries in real, after-tax terms in the aggregate, and after defaults net of recoveries and related costs, else this return too would impossibly decouple from real GDP.”

[0137]

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It would have been obvious to one of ordinary skill in the art at the time of invention to include with risk and volatility of the combined references default analyses as taught by Erlach et al. since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

32. Claims 183-184, 237-238, and 291-292 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined references in section (30) above in further view of Pub. No. 2005/0033678 to Huneault et al.

Regarding claims 183, 237 and 291:

(claim 183) The computer implemented method of claim 165, wherein one or more of the securities is an option, the method further comprising the steps of: specifying the real world distribution process that the returns on the underlying asset are expected to follow;

Sandretto teaches:

“(6) Estimate different .beta.s for each additional set of economic conditions (because risk measures are different under different economic conditions, this may sometimes be desirable). Thus, a different discount rate for each set of economic conditions would be used to determine discounted cash flows under each set of different economic conditions.” (col. 12, lines 49-55) Economic conditions reflect a real world process.

calculating the expected real world probability of the option being exercised;

See Option below.

calculating the expected mean, standard deviation and other higher moments of interest of the option, at the time the option is expected to be exercised;

“In Step 560 the user enters into computer system 1 the current estimate for each economic variable (i.e., the mean), the statistical distribution (assuming that the revised sets of economic variables are to be randomly generated using statistical methods), and any correlations between variables.” (col. 25, lines 63-67 and col. 26, line 1)

using the aforesaid parameters to calculate the expected real world pay off from the option;

See Option below.

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discounting back to present value (as at the chosen evaluation date) the pay off from the option using a risk adjusted discount rate, where said risk adjusted discount rate includes a risk premium for the expected standard deviation (measured over discrete time) of the expected option pay off, for such other higher moments of interest to the user and adjustments for any other factors specified by a user, such that the price per unit of risk, for each risk factor, is equated for two or more assets or securities selected from the options being evaluated, the underlying asset and any other securities of interest referenced thereto; and

“It is highly preferable to discount estimated cash flows rather than to discount estimated earnings. The present invention may, however, be applied to either method.” (col. 2, lines 62-65)

providing as output to a user parameters of interest from the fitted model.

“FIG. 3 is a schematic drawing of how different estimates for economic variables are used to estimate projected cash flows for each asset, how those cash flows are used to determine NPVs for each asset and for an index, how NPVs are used to determine simulated returns, how simulated returns are used to determine output risk measures, and how the iterative process is used to re-estimate NPVs and asset values;” (col. 13, lines 1-8)

The combined references teach assets, such as bonds, securities, and derivatives. They do not teach probability of an options.

Option

Huneault teaches:

“The technique of topographically mapping insurance then corresponds to a powerful and general technique for extending complete sets of solutions for option valuation to other families of probability densities.” [0189]

It would have been obvious to one of ordinary skill in the art at the time of invention to include with asset analyses of the combined references analysis of options as taught by Huneault since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

Regarding claims 184, 238 and 292:

(claim 184) The computer implemented method of claim 183, further comprising the step of using the estimated values for the rate of return, standard deviation, other higher moments of interest and any other factors specified by a user for the asset as input to price or value other options contingent on the same or similar assets.

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Sandretto teaches:

“If in Step 162 the measure of the difference between the value of each of the bonds and their market value is less than a predetermined amount, the process continues at Step 170 where the risk measure determined by the process may be printed or otherwise displayed to the user, with other useful information including asset prices, estimated inflation, estimated risk premiums, estimated standard deviations for each bond (which may be useful for evaluating options) and, if desired, over and under valued assets.” (col. 18, lines 41-49)

33. Claims 186, 205, 207, 208, 240, 259, 261-262, 294, 313, and 315-316 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined references in section (30) above in further view of Pub. No. US 2005/0021452 to Lipton et al.

Regarding claims 186, 240 and 294:

(claim 186) The computer implemented method of claim 185, further comprising the steps of:

specifying the real world distribution process that the returns on the firm's assets are expected to follow;

Sandretto teaches:

“In Step 560 the user enters into computer system 1 the current estimate for each economic variable (i.e., the mean), the statistical distribution (assuming that the revised sets of economic variables are to be randomly generated using statistical methods), and any correlations between variables.” (col. 25, lines 63-67 and col. 26, line 1)

specifying a default point representing the value of the firm's assets at which the firm is expected to default;

See Default below.

calculating the expected real world probability of the default point being met;

See Default below.

calculating the expected mean, standard deviation and other higher moments of interest of the securities being analysed, having regard to the distribution process modelled for the firm's assets and the default point, at the time horizon of interest; using the aforesaid parameters to calculate the expected real world pay off of the securities being analysed, at the time horizon of interest;

Sandretto teaches:

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“In Step 560 the user enters into computer system 1 the current estimate for each economic variable (i.e., the mean), the statistical distribution (assuming that the revised sets of economic variables are to be randomly generated using statistical methods), and any correlations between variables.” (col. 25, lines 63-67 and col. 26, line 1)

discounting back to present value (as at the chosen evaluation date) the expected pay offs of each security being analysed using a risk adjusted discount rate, where said risk adjusted discount rate includes a risk premium for the expected standard deviation of the expected pay off from the security, for such other higher moments of interest to the user and adjustments for any other factors specified by a user, such that the price per unit of risk, for each such risk factor, is equated for two or more securities issued by, or referenced to, the firm;

“Since, at least initially, the discount rate is unknown, the fourth step is to determine an initial estimate of each asset's risk measure (.beta.). The fifth step is to determine each asset's discount rate based upon the initial estimate of that asset's risk measure .beta., the risk-free rate and the market risk premium.” (col. 10, lines 50-55)

fitting the model; and

“More specifically, this invention relates to an iterative process to estimate a discount rate for each of two or more assets. This invention relates to similar iterative processes to estimate other variables or coefficients that are useful in estimating an asset's risk or NPV.” (col. 3, lines 23-29)
Therefore an iterative process solves (fits) the variables to the equations.

providing as output to a user parameters of interest from the fitted model.

“FIG. 3 is a schematic drawing of how different estimates for economic variables are used to estimate projected cash flows for each asset, how those cash flows are used to determine NPVs for each asset and for an index, how NPVs are used to determine simulated returns, how simulated returns are used to determine output risk measures, and how the iterative process is used to re-estimate NPVs and asset values,” (col. 13, lines 1-8)

The combined references teach risk for a plurality of assets. They do not teach default.

Lipton et al. teaches:

“In the second embodiment, methods and systems are provided for for calculating the financial status of a company, the method comprising the steps of: calculating the value over time of a company in accordance with Zhou's model; determining that the company defaults if at a sequence of discrete observational times the value of the company falls below a corresponding barrier level, the barrier levels selected to represent

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different debt amounts which come due at corresponding times; and calculating the transitional probability density function for the value of the company conditional on no default occurring between an initial time and an observational time using a probability vector P.” [0052]

It would have been obvious to one of ordinary skill in the art at the time of invention to include with asset analyses of the combined references default analyses as taught by Lipton et al since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

Regarding claims 205, 259 and 313:

(claim 205) The computer implemented method of claim 186, wherein the real world distribution process that the returns on the firm (or underlying asset) are expected to follow is modelled as a specified statistical distribution, wherein the mean, standard deviation and other higher moments of interest of the portions of that distribution relevant to a security are estimated using closed-form type formula solutions or numerical approximations appropriate for the specified statistical distribution process.

Sandretto teaches:

“In Step 560 the user enters into computer system 1 the current estimate for each economic variable (i.e., the mean), the statistical distribution (assuming that the revised sets of economic variables are to be randomly generated using statistical methods), and any correlations between variables.” (col. 25, lines 63-67, and col. 26, line 1)

Regarding claims 207, 261 and 315:

(claim 207) The computer implemented method of claim 205, wherein the real world statistical distribution process that the returns on the firm (or underlying asset) are expected to follow is the normal distribution.

No Patentable Weight is given to intended use language. Use of “are expected to follow...” is intended use since the returns may never follow a normal distribution.

Regarding claims 208, 262 and 316:

(claim 208) The computer implemented method of claim 207, wherein the firm has, or is treated as having, only a single class of zero coupon debt on issue and the model is fitted such that:

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$$\frac{\ln\left(\frac{V_0 e^{r_f T} [1 - N(d_1)] + B_0 e^{yT} N(d_2)}{B_0}\right) / (T - r)}{\sigma_B} = \frac{\ln\left(\frac{V_0 e^{r_f T} N(d_1) - B_0 e^{yT} N(d_2)}{S_0}\right) / (T - r)}{\sigma_S}$$

where:

S_0 is the value of the equity of the firm at time n

V_0 is the value of the firm's assets at time n and the value of the firm's assets is the sum of the values of the firm's debt (B) and equity (S)

X is the face value of the firm's debt (B), which is assumed to be a single zero-coupon bond, at maturity

T is the user selected time horizon, in years

r_f is the rate of return on the firm's assets, per annum

y is the promised yield on the firm's debt, per annum

$$d_1 = \left(\left[\ln\left(\frac{V_0}{X}\right) + r_f T \right] / \sigma_f \sqrt{T} \right) + (1/2)(\sigma_f \sqrt{T})$$

$$d_2 = d_1 - \sigma_f \sqrt{T}$$

$N(\cdot)$ is the cumulative probability of the standard normal distribution with d_1 or d_2 as the upper limit

r is the risk free rate of return, per annum

σ_f is the standard deviation of rates of return on the firm's assets, per annum

σ_B is the standard deviation of rates of return on the firm's debt, per annum

σ_S is the standard deviation of rates of return on the firm's equity, per annum.

No Patentable Weight is given to non-functional descriptive material. There are no functional steps provided, only two equations that equal each other.

34. Claims 190, 192, 244, 246, 298, and 300 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined references in section (30) above in further view of Pub. No. US 2005/0187851 to Sant.

Regarding claims: 190, 244, and 298; and claims 192, 246 and 300:

(claim 190) The computer implemented method of claim 187, wherein at least one of the unknown inputs included in one or more additional multi-variate equations comprises or represents the covariance between the returns of a pair of securities issued by, or referenced to, the firm.

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(claim 192) The computer implemented method of claim 187, wherein at least one of the unknown inputs included in one or more additional multi-variate equations comprises or represents the covariance between the returns of a security issued by, or referenced to, the firm and the returns of the total firm.

The combined references teach asset analyses. They do not teach covariance.

Sant teaches:

[0444] The last equation represents the Security Market Line (refer to FIG. 34). Where, w_j is the weight of stock j in a portfolio and RP_M is the risk premium on the market index portfolio, which defaults to 5% but is user controlled. Portfolio beta (b_P) is also used to compute the diversifiable risk and systematic risk of the portfolio (3405).

$$\text{Diversifiable risk of portfolio} = \sigma_P^2 - b_P^2 \times \sigma_M^2$$

$$\text{Portfolio variance} = \sigma_P^2 = \sum \sum w_i w_j \text{Cov}_{ij}$$

$$\text{Covariance of a pair of stocks} = \text{Cov}_{ij} = (1/n-1) \sum (R_{it} - R_i)(R_{jt} - R_j)$$

$$\text{Systematic risk of portfolio} = b_P^2 \times \sigma_M^2$$

$$\text{Market index variance } \sigma_M^2 = (1/n-1) \sum (R_{Mt} - R_M)^2$$

$$R_M = (1/n) \sum R_{Mt}$$

It would have been obvious to one of ordinary skill in the art at the time of invention to include with asset analyses of the combined references covariance as taught by Sant since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

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35. Claims 193-194, 247-248, and 301-302 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined references in section (30) above in further view of Pub. No. US 2005/0021452 to Lipton et al.

Regarding claims: 193, 247 and 301; and claims 194, 248 and 302:

(claim 193) The computer implemented method of claim 187, wherein at least one of the unknown inputs included in one or more additional multi-variate equations comprises or represents the expected probability of default.

(claim 194) The computer implemented method of claim 187, wherein at least one of the unknown inputs included in one or more additional multi-variate equations comprises or represents the expected loss given default on a debt-type security issued by, or referenced to, the firm.

The combined references teach risk for a plurality of assets. They do not teach default.

Lipton et al. teaches:

“In the second embodiment, methods and systems are provided for for calculating the financial status of a company, the method comprising the steps of: calculating the value over time of a company in accordance with Zhou's model; determining that the company defaults if at a sequence of discrete observational times the value of the company falls below a corresponding barrier level, the barrier levels selected to represent different debt amounts which come due at corresponding times; and calculating the transitional probability density function for the value of the company conditional on no default occurring between an initial time and an observational time using a probability vector P.” [0052]

It would have been obvious to one of ordinary skill in the art at the time of invention to include with asset analyses of the combined references default analyses as taught by Lipton et al since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

36. Claims 198, 252, and 306 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined references in section (30) above in further view of Pub. No. US 2005/0187851 to Sant.

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Regarding claims 198, 252 and 306:

(claim 198) The computer implemented method of claim 185, further comprising the steps of generating one or more parameters from the model and solving the model so that the said parameters equal values specified by a user, where one of the said parameters is the covariance between the returns of a pair of securities issued by, or referenced to, the firm.

The combined references teach asset analyses. They do not teach covariance.

Sant teaches:

[0444] The last equation represents the Security Market Line (refer to FIG. 34). Where, w_j is the weight of stock j in a portfolio and RP_M is the risk premium on the market index portfolio, which defaults to 5% but is user controlled. Portfolio beta (b_P) is also used to compute the diversifiable risk and systematic risk of the portfolio (3405).

$$\text{Diversifiable risk of portfolio} = \sigma_P^2 - b_P^2 \times \sigma_M^2$$

$$\text{Portfolio variance} = \sigma_P^2 = \sum \sum w_i w_j \text{Cov}_{ij}$$

$$\text{Covariance of a pair of stocks} = \text{Cov}_{ij} = (1/n-1) \sum (R_{it} - R_{jt})(R_{jt} - R_{jt})$$

$$\text{Systematic risk of portfolio} = b_P^2 \times \sigma_M^2$$

$$\text{Market index variance } \sigma_M^2 = (1/n-1) \sum (R_{Mt} - R_M)^2$$

$$R_M = (1/n) \sum R_{Mt}$$

It would have been obvious to one of ordinary skill in the art at the time of invention to include with asset analyses of the combined references covariance as taught by Sant since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

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37. Claims 200, 254, and 308 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined references in section (30) above in further view of Pub. No. US 2005/0187851 to Sant.

Regarding claims 200, 254, 308:

(claim 200) The computer implemented method of claim 185, further comprising the steps of generating one or more parameters from the model and solving the model so that the said parameters equal values specified by a user, where one of the said parameters is the covariance between the returns of a security issued by, or referenced to, the firm and the returns of the total firm.

The combined references teach asset analyses. They do not teach covariance.

Sant teaches:

[0444] The last equation represents the Security Market Line (refer to FIG. 34). Where, w_j is the weight of stock j in a portfolio and RP_M is the risk premium on the market index portfolio, which defaults to 5% but is user controlled. Portfolio beta (b_p) is also used to compute the diversifiable risk and systematic risk of the portfolio (3405).

$$\text{Diversifiable risk of portfolio} = \sigma_p^2 - b_p^2 \times \sigma_M^2$$

$$\text{Portfolio variance} = \sigma_p^2 = \sum \sum w_i w_j \text{Cov}_{ij}$$

$$\text{Covariance of a pair of stocks} = \text{Cov}_{ij} = (1/n-1) \sum (R_{it} - R_{jt})(R_{jt} - R_{jt})$$

$$\text{Systematic risk of portfolio} = b_p^2 \times \sigma_M^2$$

$$\text{Market index variance } \sigma_M^2 = (1/n-1) \sum (R_{Mt} - R_M)^2$$

$$R_M = (1/n) \sum R_{Mt}$$

It would have been obvious to one of ordinary skill in the art at the time of invention to include with asset analyses of the combined references covariance as taught by Sant since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of

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ordinary skill in the art would have recognized that the results of the combination were predictable.

38. Claims 201, 255, and 309 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined references in section (30) above in further view of Pub. No. US 2005/0021452 to Lipton et al.

Regarding claims 201, 255 and 309:

(claim 201) The computer implemented method of claim 185, further comprising the steps of generating one or more parameters from the model and solving the model so that the said parameters equal values specified by a user, where one of the said parameters is the expected probability of default.

The combined references teach risk for a plurality of assets. They do not teach default.

Lipton et al. teaches:

“In the second embodiment, methods and systems are provided for for calculating the financial status of a company, the method comprising the steps of: calculating the value over time of a company in accordance with Zhou's model; determining that the company defaults if at a sequence of discrete observational times the value of the company falls below a corresponding barrier level, the barrier levels selected to represent different debt amounts which come due at corresponding times; and calculating the transitional probability density function for the value of the company conditional on no default occurring between an initial time and an observational time using a probability vector P.” [0052]

It would have been obvious to one of ordinary skill in the art at the time of invention to include with asset analyses of the combined references default analyses as taught by Lipton et al since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

39. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 20010053993 A1

US-PGPUB McLean et al.

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US 20020184067 A1	US-PGPUB	McLean et al.
US 20030018506 A1	US-PGPUB	McLean et al.
US 20030093347 A1	US-PGPUB	Gray
US 20040064393 A1	US-PGPUB	Luenberger
US 20050262014 A1	US-PGPUB	Fickes
US 6125355 A	USPAT	Bekaert et al.
US 7315842 B1	USPAT	Wang
US 7386466 B2	USPAT	McLean et al.
US 7389260 B1	USPAT	McLean et al.
US 7752126 B2	USPAT	Wang
US 7756732 B2	USPAT	McLean et al.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KENNETH BARTLEY whose telephone number is (571)272-5230. The examiner can normally be reached on Mon-Fri; 8:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jagdish Patel can be reached on (571) 272-6748. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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